

# KE-100.4810 BIOPOLYMERS (3 cr)

Exam 23.5.2013

Answer either in Finnish or in English.

1. Explain briefly with a biodegradable polymer example the following terms:

a) Microbial polyester PHA fermentation  $-OCH_2CH_2CH_2CO-$

b) Ring opening polymerization PLA polylactide

c) Autocatalytic degradation Bulk degradation of LA/GA and copolymers of these  $>2\mu m$  water in cleavage of ester bonds oligomers to center pH fast degradation inside water-soluble sized hollow structure membranes/ligaments migrate

2. Describe the life cycle of a biodegradable polymer based on a renewable raw material. Draw a diagram. biomass  $\rightarrow$  lactic acid  $\rightarrow$  polymerization  $\rightarrow$  processing  $\rightarrow$  product  $\rightarrow$  composting  $\rightarrow$  biomass

3. Explain the difference between homogenic bulk erosion and heterogenic surface erosion. Give an example of a bulk erodible polymer and a surface erodible polymer.

poly anhydrides

PLA

erosion when hydrophobic polymer with hydrolyzable bonds enzymatic

bulk when hydrophilic -1- hydrolysis

4. Describe the preparation of lactic acid based polymers. Draw different synthesis routes. chain linking ester-linking azeotropic distillation

Tin(D)ock

5. List and explain at least 6 ideal properties of scaffolds for tissue engineering.

biocompatible biodegradable tissue-like mech. properties porous (linked)  $\rightarrow$  degrade surface for growth design bioactive stress shielding